TESTIMONY OF NICOL TURNER LEE
Fellow, Center for Technology Innovation, Brookings Institution

Before the
Subcommittee on Consumer Protection and Commerce
United States House Committee on Energy and Commerce

Hearing on "Inclusion in Tech: How Diversity Benefits All Americans"

March 6, 2019

Chairwoman Schakowsky, Ranking Member Rodgers and Members of the Committee, thank you for the opportunity to testify. I am encouraged by the interest of this committee on the issue of inclusion in tech, particularly as some Members of this subcommittee have worked to diversify their own staff. I am Nicol Turner Lee, Fellow in the Center for Technology Innovation at the Brookings Institution. With a history of over 100 years, Brookings is committed to evidenced-based, nonpartisan research in a range of focus areas. My particular research expertise encompasses data collection and analysis around regulatory and legislative policies that govern telecommunications and high-tech companies, along with the impacts of digital exclusion, artificial intelligence and machine-learning algorithms on vulnerable consumers. My new book, *Digitally invisible: How the internet is creating the new underclass* also addresses this topic and will be published by Brookings Institution Press next year.

Let me start my testimony by strongly asserting that the absence of diversity among the people that make the decisions around products and services for the tech sector, along with the markets that these companies serve will ultimately doom the United States to abysmal failure.

With the U.S. population projected to become "minority white"[1] in 2045, as documented by my colleague William Frey, tech companies that do not fully embrace diversity will ultimately compromise the quality of solutions and future technologies and make it difficult for all people to gain the benefits of the digital revolution.

In my testimony, I will touch upon why diversity matters in the burgeoning digital economy and the threats to our democracy when efforts to diversify people, products and services fail or are non-existent. I will conclude my testimony with recommendations for Congress and the private sector on how to safeguard consumers from the discriminatory effects of the explicit and implicit biases often linked to non-diverse workplaces, identify and mitigate algorithmic biases, and employ strategies to recruit and hire professionals from underrepresented populations.

I. Background

According to a study by Accenture, one-fifth or 22 percent of the world's economic output is generated by the digital economy, with investments in the United States accounting for 33 percent of its output.[2] Over 40 percent of the U.S. labor force and 26 percent of its accumulated capital comes from digital and related activity compared to other countries.[3] The digital sharing economy and the broad net of digital goods comprise this sector, creating

[1] William H. Frey (2018). "The U.S. will become 'minority white' in 2045, Census projects: Youthful minorities are the engine of the future." *Brookings Institution*, March 14, 2018. Available at https://www.brookings.edu/blog/the-avenue/2018/03/14/the-us-will-become-minority-white-in-2045-census-projects/ (accessed March 2, 2019).
[2] Knickrem, M., Berthon, B. and Daugherty, P. (2016). Digital Disruption: The Growth Multiplier. *Accenture Strategy*. Available at https://www.accenture.com/t00010101T000000__w__/br-pt/_acnmedia/PDF-14/Accenture-Strategy-Digital-Disruption-Growth-Multiplier-Brazil.pdf (accessed March 3, 2019).
[3] Ibid

abundant opportunities for greater diversity and inclusion. At the core of the sharing economy are exchange-oriented activities that happen between individuals over online platforms for free or for a fee. Examples of these activities include ride-sharing services (e.g., Uber and Lyft), home or vacation rentals (e.g., Airbnb and VRBO), or online job matching sites (e.g., TaskRabbit or SquarePeg). The digital economy casts a much larger net, including the skills, equipment and variety of other goods and services enabled by the internet and high-speed broadband networks. Generally, existing and emerging technologies are helping society solve complex social problems through automation, advanced scientific research and artificial intelligence (AI), while disrupting legacy industries and widely accepted norms.

Despite the narrowing of digital disparities across the U.S., Pew research indicates that approximately 13 percent of African-Americans, 11 percent of Hispanics, 35 percent of those lacking a high school degree, 22 percent of rural residents, and 37.2 percent of households that speak limited English lack access to the internet through high-speed broadband service.[4] Not surprising, mobile access has converged among many of these groups with 77 percent of whites, 75 percent of African-Americans, and 77 percent of Hispanics owning a smartphone, according to the Pew Research Center.[5] For many whites, access to the internet via a smartphone supplements a high-speed, in-home broadband connection, while lower-income

[4] Ryan, Camille (2018). Computer and Internet Use in the United States: 2016. *American Community Survey Reports*. U.S. Census, August 2018. Available at https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-39.pdf. (accessed March 3, 2019). See also, Anderson, M., Perrin, A. and J. Jingjing (2018). 11% of Americans Don't Use the Internet. Who Are They? *Pew Research Center Blog*, March 5, 2018. Available at: http://www.pewresearch.org/fact\tank/2018/03/05/some americans-don't use-the-internet-who-are they/. (accessed March 2, 2019).

[5] "Mobile Fact Sheet." 2018. Washington, DC: *Pew Research Center*, February 5, 2018. Available at http://www.pewinternet.org/fact-sheet/mobile/. (accessed March 2, 2019)

populations, less-educated and even younger populations tend to be more "smartphone-dependent," relying on mobile broadband as their primary – and often only – connection to the internet.[6] Further, 35 percent of Hispanics and 24 percent of African-Americans have no other online connection except through their smartphones or other mobile devices, compared to 14 percent of whites. Finally, 31 percent of individuals making less than $30,000 per year regularly rely upon their mobile device as their only gateway to the internet.[7]

Many of these smartphone-dependent populations closely resemble those impacted by higher rates of unemployment, the "homework gap" and limited economic mobility. They are also most susceptible to digital disruption when the jobs that they once held are automated and eventually eliminated, or online predatory products and services are marketed to them on an ongoing basis. Given these realities, the prioritization of diversity and inclusion matters in the tech sector because it ensures that these consumers will be protected from the consequential harms emanating from the design and implementation of ill-advised online products and services.

II. Where is the talent "pipeline"?

According to new research from Brookings, African-Americans and Hispanics remain vastly underrepresented in the computer and mathematical fields (C&M), despite their increased participation in the broader tech workforce, including computer programming and operations research.[8] African-Americans comprise 11.9 percent of all workers in the tech sector, but only

[6] Ibid.
[7] "Internet/Broadband Fact Sheet" (2018). Washington, DC: *Pew Research Center*, February 5, 2018. www.pewinternet.org/fact-sheet/internet-broadband. (accessed March 2, 2019)
[8] M. Muro, A. Berube, and J. Whiton (2018). "Black and Hispanic underrepresentation in tech: It's time to change the equation. *Brookings Institution*, March 28, 2018. Available at

7.9 percent of workers in the C&M fields.[9] Hispanics make up 16.7 percent of all workers in tech, but only 6.8 percent of C&M workers, according to Brookings research. In fact, these numbers represent a decline in minority participation during the period of 2002 to 2016, making African-Americans and Hispanics the most underrepresented in certain tech jobs by nearly 50 percent.[10]

Civil rights advocates, including the National Urban League and the Rainbow PUSH Coalition, have consistently called out the tech sector on their lackluster efforts to change their practices and recruit more diverse leadership on boards, in C-suite positions and as frontline workers. In the National Urban League's 2018 State of Black America report, the findings indicated that despite 8.2 percent of all degrees conferred to African-Americans were in the STEM fields, only 5.7 percent of total black employment in 2017 was in the tech sector.[11] For whites, 12.8 percent of degrees were conferred to whites in STEM, and 8.5 percent of white workers were in the tech industry.[12] Further, fewer than 5 percent of the tech workforce in social media companies is African-American, with similar findings for Hispanics and certain Asian American populations.

The role of Historically Black Colleges and Universities (HBCUs) and Hispanic-Serving Institutions (HSIs) are often discounted in remedying pipeline concerns. Twenty-two percent of African-American college students graduate from one of the 101 HBCUs and offer some of the

---

https://www.brookings.edu/research/black-and-hispanic-underrepresentation-in-tech-its-time-to-change-the-equation/ (accessed March 3, 2019)

[9] Ibid.

[10] Ibid.

[11] State of Black America (2018). Save our cities: Powering the digital revolution. *National Urban League*. Available at http://soba.iamempowered.com/sites/soba.iamempowered.com/files/SOBA2018-Digital%20Inclusion%20Index.pdf (accessed March 2, 2019).

[12] Ibid.

nation's most gifted talent, which are prepared to work in Silicon Valley. Despite the creation of existing partnerships and programs with HBCUs to address pipeline concerns, tech companies generally rely upon a smaller subset of schools to find scientists, programmers, engineers, and other tech-aligned employees, contributing to the narrative around the shortage of workers.[13] In a Gallup poll of over 60,000 college graduates from a range of higher education institutions, HBCU graduates had the highest rate of financial, career, and emotional well-being when compared to other respondents, despite being scarcely recruited and hired at tech companies.[14] They deserve a chance to demonstrate their talent.

Unfortunately, there are disparities between the amenities, services and funding found at majority versus minority-serving colleges and universities. Technology access can be scarce or virtually non-existent at HBCUs and HSIs due to limited institutional resources or infrastructure. HBCUs and other minority-serving colleges and universities are also subjected to decreased or unequal government funding, contributing to the lack of technology on campus or faculty in technological fields, such as artificial intelligence and data analytics. According to the State of Black America report, HBCUs receive fewer research and development funds per student and as a result, spend less per student compared to predominantly-white colleges and universities.[15] The average HBCU receives just 10.2 percent of the federal per student R&D funds directed to

[13] Brittany Oliver (2018). Top companies are missing talent from historically black colleges. Fast Company, February 27, 2018. Available at https://www.fastcompany.com/40535627/top-companies-are-missing-talent-from-historically-black-colleges (accessed March 3, 2019).
[14] Ibid.
[15] State of Black America (2018). Save our cities: Powering the digital revolution. *National Urban League*. Available at http://soba.iamempowered.com/sites/soba.iamempowered.com/files/SOBA2018-Digital%20Inclusion%20Index.pdf (accessed March 2, 2019).

non-HBCUs and spends just 7.9 percent of what the average non-HBCUs spend on R&D per student, making the case for improved federal budget appropriations to these institutions.[16]

While limited budgets and other constraints of HBCUs and HSIs may limit the advancement of their students in highly-technical fields, it's no excuse for the lackluster recruitment, hiring and retention of talented individuals of color. While some tech companies have been more proactive in their efforts to recruit from these institutions, others should follow suit to once and for all further diversity on their corporate campuses.[17] Moreover, investments in programs which promote STEM and coding among school-age youth should increase and institute direct pathways to mentorship and employment into the tech sector.

III. Bias in consumer products

In addition to these human resource concerns, the tech sector must also have diligence in applying diversity and inclusion principles to the design, execution and evaluation of their products and services. The problems associated with application redlining[18] can have long-term effects on protected groups, expanding systemic discrimination and racism to online platforms and other tech-related products. Whether it's the explicit bias of online users who ultimately leverage these products to discriminate or the implicit biases of technologists, consumers are

[16] Ibid.

[17] Google has extended its recruitment efforts to HBCUs through its Tech Exchange program which partners with 11 HBCUs and HSIs by sending students to their Mountain View, California campus. They also instituted a program model called Howard West, a pilot with Howard University to place students at their corporate office.

[18] "Application redlining" is a term defined by the Multicultural Media, Telecom and Internet Council ("MMTC") in a letter to the Hon. Larry Strickling, January 13, 2017. The term is compared to the practice of "geographic redlining," which has a long history of keeping people of out of schools, banks and most notoriously, homes.

left to identify and mitigate these inequalities, often with limited resources and understanding for how the internet works.

A. Big data and explicit bias

Today, big data are collected in real-time from users through a series of interactions with web sites, social media platforms, e-commerce vehicles and targeted online search queries. These portions of data become compiled, mined and eventually repurposed for commercial or public use. Big data serves a variety of purposes, from helping to advance breakthroughs in a variety of social service applications such as health care, science, energy, education and transportation to enhancing government efficiencies through aggregated citizen input.

However, big data can also exclude populations. In a report published by the Federal Trade Commission (FTC), the agency with regulatory oversight over high tech companies, when big data analytics are misapplied, online users can be tracked, profiled and subject to massive surveillance based on their online activities and behaviors.[19] Consequently, users can be denied credit based on their web browsing history or aggregated predictive analytics can wrongly determine an individual's suitability for future employment or an educational opportunity. Online proxies, including one's zip code, can also be used by marketers to extrapolate and potentially exploit an individual's socioeconomic status based on neighborhood, resulting in subjective assumptions about one's lifestyle or preferences.[20] In these and other examples, the

[19] Ramirez, E., J. Brill, Ohlhausem, K., McSweeny, T. (2016). Big Data: A tool for inclusion or exclusion. FTC. Available at: https://goo.gl/wUxwU1 (accessed March 3, 2019).
[20] Noyes, K. (2015). Will big data help end discrimination—or make it worse? Fortune. Available at: http://fortune.com/2015/01/15/will-big-data-help-end-discrimination-or-make-it-worse/ (accessed March 3, 2019).

collection of online data can potentially lead to the disparate treatment of protected classes, which are distinguishable by their race, gender, age, ability, religion and sexual orientation.

In 2016, Airbnb, an online home-sharing company and app, found some hosts were rejecting renters based on race, age, gender and other factors. In these cases, renters were acting upon their own explicit biases, which were enabled by the technology platform. While Airbnb has worked to eradicate these types of biases through community commitment agreements that reinforce legal compliance, the harmed renters were subjected to unfair racial treatment and systemic online discrimination.[21]

Among ride-sharing services, researchers exposed similar occurrences of explicit discrimination when Uber and Lyft drivers were found to be either cancelling rides or extending the wait times of African-American customers in Boston and Seattle.[22] In a sample of 1,500 rides in both cities, the study found that Uber drivers were more likely to cancel on riders with "black sounding" names, and that African-Americans typically waited longer to be picked up.[23] The study also concluded that women were taken on longer routes to extend the cost of the fare.[24] Uber has since elevated its commitment to diversity through the hiring of key executives tasked with addressing these types of challenges.

[21] Murphy, L. (2016). Airbnb's work to fight discrimination and build inclusion. Airbnb Blogs. Available at: https://goo.gl/2GtAQ8 (accessed March 3, 2019).
[22] Ge, Y., Knittel, C., MacKenzie, D., Zoepf, S. (2016). Racial and gender discrimination in transportation network companies. The National Bureau of Economic Research. Available at: https://www.nber.org/papers/w22776 (accessed March 2, 2019).
[23] Ibid.
[24] Ibid.

In these cases of explicit bias, algorithms - which are the scientific procedures that automate problem-solving or a sequence of repetitive tasks[25] - are powering these actions, which may not start out being discriminatory or have prejudicial intent. However, over time, the algorithm can adapt to the personal biases that are baked within its model or adjust to historical and societal biases, resulting in unfair stereotypes and profiling.

Unfortunately, the identification and mitigation of biases and discriminatory practices are becoming much harder when big data is weaponized against certain groups (e.g., in elections) or when algorithmic decisions are driven by implicit or unconscious biases, resulting in critical misjudgments and assessments about certain groups.

B. *Algorithmic bias driven by implicit and unconscious assumptions*

Consider the results of these innocuous search queries when exploring the role of implicit or unconscious biases. In 2011, author Safiya Noble found that on a Google search query of the words "black girls" returned mostly pornographic and sexually explicit content. In 2013, online search results for "black-sounding names" were more likely to link arrest records with profiles, even when false. In 2015, Google apologized for an algorithm that automatically tagged and labeled two African-Americans as "gorillas" after an online word search. In 2016, a comparative search of "three black teenagers" and "three white teenagers" generated very different search results. The former returned a range of police mug shots of young, African-American males, while the latter produced groups of white teenagers smiling.[26]

---

[25] C.T. (2017). What are algorithms? *The Economist.* Available at: https://goo.gl/C32K1f (accessed March 4, 2018).

[26] Jessica Guynn (2016). Three black teenagers google search sparks outrage. *USA Today*, June 10, 2016. Available at: http://www.usa.today/story/tech/news/2016/06/09/google-image-search-three-black-teenagers-three-white-teenagers/85648838/ (accessed March 2, 2019).

While Google has proactively addressed the errors generated in these displays of algorithmic bias by improving upon the training data and models used to construct the said algorithms, these examples point to the need for more diverse workforces on the business development side.

The Kirwan Center for the Study of Race and Ethnicity defines implicit bias as "the attitudes or stereotypes that affect our understanding, actions, and decisions in an unconscious manner."[27] Citing individuals' common susceptibility to these biases, the Kirwan Center found that it is the nature of homogenous associations and relationships to harbor particular feelings and attitudes about others based on race, ethnicity, age, and appearance.[28] Compared to explicit bias, implicit bias in the digital age can appear in courts and parole boards that have become increasingly reliant upon predictive analytics to determine future criminal behavior, or appropriate bail and sentencing limits. Some researchers have found that many of the predictive algorithms are inaccurate or still fueled by societal stereotypes, leading to African Americans being predicted as more likely to commit violent crimes than whites.[29] For example, questions have emerged around the race neutrality of the popular COMPAS [30] algorithm, which assigns risk scores between 1 and 10 to assess the likelihood of a defendant's future criminal activity. Based on the algorithm, defendants with scores of 7 are more likely to reoffend at

[27] Kirwin Center. (2015). Implicit Bias Review 2015: State of the Science. *Kirwan Center for the Study of Race and Ethnicity.* Available at: https://goo.gl/RRmSLG (accessed March 5, 2018).
[28] Ibid.
[29] Angwin, J. Larson, J. (2016). Bias in Criminal Risk Scores Is Mathematically Inevitable, Researchers Say. *Propublica.* Available at: https://goo.gl/S3Gwcn (accessed March 5, 2018).
[30] Yong, E. (2017). A Popular Algorithm Is No Better at Predicting Crimes Than Random People. *The Atlantic.* Available at: https://goo.gl/VRnD6K (accessed March 5, 2018).

twice the rate as those with scores of 3.[31] High risk defendants are more likely to be detained while awaiting trial based on their COMPAS score. Unfortunately, when these predictions are not accurate, certain groups are left to suffer irreparable harms, especially blacks who are historically unjustly punished and more harshly penalized than whites.

Implicit bias also presents itself in the complex calculations of machine learning and AI. In her research on "word embedding," which is commonly used in translation apps, Joanna Bryson found this type of bias creates issues for machines that do not have the moral compass of humans when it comes to identifying stereotypical traits.[32] In this application, researchers have discovered that words that included "female" and "women" were more likely to be associated with arts and humanities occupations, while "male" and "man" were often correlated with math and engineering jobs, thereby creating false positives and negatives.[33] The same study also surfaced that European American-sounding names were more likely as associated with pleasant word associations, while "black-sounding" names were often associated with unpleasant words.[34] Consequently, stereotypes about African Americans remained pervasive.

The negative implicit assumptions associated with words and predictive criminal justice models unmask the fact that algorithms are not necessarily devoid of societal biases, prejudices, stereotypes and even incorrect assessments about people and their circumstances.

These are the reasons why diversity matters.

---

[31] Corbette-Davies, S. Pierson, E. Feller, A. Goel, S. Huq, A. (2017). Algorithmic decision making and the cost of fairness. *Conference on Knowledge, Discovery, and Data Mining.* Available at: https://goo.gl/WDaqTX (accessed March 5, 2018).
[32] Caliskan, A. Bryson, J. Narayanan, A. (2017). Semantics derived automatically from language corpora contain human-like biases. *Science*. Available at: https://goo.gl/TxaG6d (accessed March 5, 2018).
[33] Ibid.
[34] Ibid.

IV. Recommendations

While it is with good intent that Congress has convened today's hearing, what happens next? Should Congress be encouraging some level of self-regulatory behavior among the tech sector or introducing policy interventions that ensure digital equity? My final section outlines a set of high-level recommendations for consideration among Members of the committee and Congress as a whole.

1. **The tech sector must be more deliberate and systematic in the recruitment, hiring and retention of diverse talent to avert and address the mishaps generated by online discrimination, especially algorithmic bias.**

Less diverse workforces contribute to algorithmic bias, whether intentional or not. Recent diversity statistics report these companies employ less than two percent of African Americans in senior executive positions, and three percent of Hispanics when compared to 83 percent of whites.[35] Asian-Americans comprise just 11 percent of executives in high tech companies.[36] In the occupations of computer programmers, software developers, database administrators, and even data scientists, African-Americans and Hispanics collectively are under six percent of the total workforce, while whites make up 68 percent.[37] Even when people of color are employed in high tech industries, the feelings of professional and social isolation also have been shown to marginalize these employees, potentially restricting their active workplace engagement, affecting their participation in the feedback loop, and contributing to higher rates of attrition.[38]

---

[35] Atwell, J. (2016). Lack of women and minorities in senior investment roles at venture capital firms. *Deloitte.* Available at: https://goo.gl/iah1VZ (accessed March 5, 2018).
[36] Ibid.
[37] EEOC. (2016). Diversity in High Tech. *EEOC*. Available at: https://goo.gl/EwKBUJ (accessed March 5, 2018).
[38] Scott, A. Kapor Klein, F. Onovakpuri,U. (2017). Tech Leavers Study. *Kapor Center*. Available at: https://goo.gl/Zgf6dg (accessed March 5, 2018).

At Google, employees have been subjected to anti-diversity memos,[39] and women have experienced documented backlash from male employees on hiring. This alienation within high-tech workforces neither encourages nor welcomes diverse input into work products. It also may distract from efforts to incorporate elements of "diversity in the design" of algorithms, where biases can be avoided at the onset. In the case where the algorithm led to the misidentification of African Americans as "gorillas," the Google app developer pointed out that he didn't anticipate the technology's poor identification of darker-skinned faces,[40] which was due to his analysis of training datasets largely populated by whites and most likely, the absence of a diverse work team who would potentially be more sensitive to these issues.

Technologists may not be necessarily trained to identify cues that are outside of their cultural context and can be fenced into work groups that share similar experiences, values and beliefs. For example, when the algorithm for FaceApp lightened the skin tones of black users, it was unconsciously (and perhaps explicitly) signaling mainstream, or European American, standards of beauty, and applying them to blacks – a compelling reason for why racial diversity was needed on the design team.[41] These behaviors are what some researchers have dubbed *inattentional blindness*.

These largely unconscious bias errors strongly support why high-tech companies should be striving for more diverse workforces to identify and quell online discrimination. Companies that

---

[39] Conger, K. (2017). Here's the 10-page anti-diversity screed circulating internally at Google. *Gizmodo*. https://goo.gl/UEYNhx. Available at: https://goo.gl/9ctiyF (accessed March 5, 2018).
[40] Miller, D. (2017). Design biases in Silicon Valley are making the tech we use toxic, expert says. *Australian Broadcasting Company.* Available at: https://goo.gl/6WGaon (accessed March 5, 2018).
[41] Morse, Jack. (April 24, 2017). "App creator apologizes for 'racist' filter that lightens skin tones." *Mashable*. Available at: https://mashable.com/2017/04/24/faceapp-racism-selfie/#zeUItoQB5iqI (accessed March 5, 2018).

are disrupting societal norms through the sharing economy, social media and the internet of things must do better to address the less than remarkable representation of people of color as creators, influencers and decision makers.

As in the case of HBCUs and HSIs, the tech sector should work to strengthen those relationships and programs, which target these students for future employment. Congress and federal agencies, including the U.S. Department of Education, need to also do more to ensure that minority-serving institutions are establishing premiere programs that include both technology access and cutting-edge career development in fields where the nation will soon face massive shortages. We need to take notes from the former Obama administration that pushed the U.S. toward a "race to the top," urging collaboration between the private and public sectors to realize the nation's global competitiveness and edge over our international counterparts.

2. **Tech companies must explore ethical and collaborative frameworks that explore the unintended biases of algorithms and deploy solutions that quell these biases.**

The tech sector must be more proactive in developing solutions that reduce, or better yet, eliminate bias from newer and emerging technologies. Transitioning to a more of a "white-box" construct for designing and evaluating algorithms, the tech sector can employ better practices that pre-identify potential unintended consequences of algorithms, while minimizing the effects of digital inequalities. Further, tech companies must recognize that data scientists, engineers and other innovators bring their own set of explicit, implicit, and unconscious biases to the design of computer systems and computational procedures. Without getting too technical in my testimony, operators of algorithms, including the companies that license and distribute them, must also pay more attention to the training data being used to create these

models and the unintended consequences potentially lurking underneath. Current challenges of facial recognition software are unearthing these discrepancies, particularly in the accurate identification of darker-skinned complexions.[42]

Tech companies must continue to willingly advance conversations on ethical frameworks for algorithms. At the very least, algorithms should not perpetuate historical inequities that perpetuate discrimination online. Next month, I will be issuing a paper on algorithmic bias detection and mitigation, co-authored with a technologist and a civil society stakeholder, on the importance of developing quality instruments and questions which measure the extent and impact of bias for companies, government and others that are in the business of developing algorithms.[43]

Finally, employing "diversity in the design" of algorithms upfront can trigger and potentially avoid harmful discriminatory impacts on certain protected groups. While the immediate consequences of biases may be considered small, operators of algorithms should not discount the possibility or prevalence of bias and should seek diverse workforce participation in its development, integrate inclusive products and spaces in their products (e.g., improved focus groups or codes programmed by minority developers), and employ tools that ensure that cultural biases are identified upfront and checked throughout the process, potentially giving consumers the opportunity to provide feedback on the algorithm's treatment.

3. **Congress should modernize civil rights laws to safeguard protected classes from discrimination.**

[42] Buolamwini, Joy Adowaa (2017). "Gender Shades: Intersectional Phenotypic and Demographic Evaluation of Face Datasets and Gender Classifiers." *Massachusetts Institute of Technology*. Available at: https://dspace.mit.edu/handle/1721.1/114068 (accessed March 2, 2019)

[43] N. Turner Lee, P. Resnick and G. Barton (2019). Algorithmic bias detection and mitigation: Best practices and policies to reduce consumer harm. *Brookings Institution* (forthcoming in April 2019).

Finally, the strength of the online economy proves that it is no longer insulated from the guardrails designed for other regulated industries, especially those that establish baseline protections against discrimination. Consequently, Congress should consider a review and the potential modernization of civil rights laws and apply them to certain online use cases. In 1964, Congress passed Public Law 88-52 that "forbade discrimination on the basis of sex as well as race in hiring, promoting, and firing." The Civil Rights Act of 1968 was amended to include the Fair Housing Act, which further prohibits discrimination in the sale, rental and financing of dwellings, and in other housing-related transactions to federally mandated protected classes. The Equal Credit Opportunity Act (ECOA) in 1974 prohibits any creditor from discriminating against any applicant from any type of credit transaction based on protected characteristics. Without question, many of these legislative and regulatory frameworks should be applied to digital and other-related activities which seek to harm online users, especially individuals from protected classes.

Congress might also promote self-regulatory models where businesses identify, monitor and correct biases that negatively impact the online experiences of users. For example, Google's decision to ban ads that promoted payday loans was an example of self-regulation. Or, Facebook's updates to its ad policies to prevent race-based targeting, especially those that attempt to include or exclude demographic groups in housing, employment and credit, is another example of how companies are correcting ill-advised practices.

In the end, it is important for Congress to determine what role, if any, they want to play in prescribing some level of accountability to tech companies going forward. It may be the case

that without accountability or further conversation between policymakers, technologists and civil society, this conversation will be for naught.

V. Conclusion

Diversity matters to business and unless tech companies, who have grown exponentially comfortable with their consumers, take meaningful steps responsive to the issues that I've identified, they will sacrifice our nation's place in the global digital marketplace.

Thank you again to the Members of the Committee for the opportunity to testify before you and I look forward to your questions.